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The Papers read were—

1. *Ocean Currents on the North-East Coast of South America.* By J. A. MANN, Esq., F.R.G.S.

THE current or ocean-stream setting along the north-east coast of South America, from Cape St. Roque to the West India Islands, known as the Guiana current, is supposed to run continuously in a north-west direction, at a rate varying from 1 to 4 knots per hour.

In this paper is given an account of a voyage of the brigantine *Monte Christo*, from Cayenne, in French Guiana, to Paranahiba in Brazil, in July and August, 1862, from which the author considers that the current was at that time reversed in a most unmistakeable manner. The departure was taken from "Ile la Mer," one of the islands known as "Remire" off Cayenne, on the 26th; the wind blowing east, with which a direct northerly course was made until the 30th, when the position of the ship was 7° north, and in the same longitude as Cayenne. On this date the wind changed to the south, and continued to blow from that quarter to the s.s.w. until the 7th of August, when the ship's position by dead reckoning was $42^{\circ} 14'$ W., and an Austrian ship that was spoken, gave the position as 27° W. It was not discovered until some days after, when a second ship was spoken, that the latter was the actual position. From this it appears that for eight consecutive days the *Monte Christo* was drifted at the rate of $4\frac{1}{2}$ knots an hour in an e.s.e. direction, diametrically opposite to the usual flow of the stream. Throughout the remainder of the voyage, extending over a further period of fourteen days, the same current was experienced. The captain of another ship, the *Loyal*, which came into Paranahiba some days after, having a chronometer on board, had abandoned his observations believing his chronometer to be out of order. Also while sailing on board the French man-of-war steamer *Alecton*, from Surinam to Cayenne, the author met with the same phenomenon, leaving little room for doubt that the current was reversed throughout, and for a considerable time.

Mention is made of unusual winds, south and s.s.w., at Surinam. These coming up from the Cordilleras, were very patent, causing influenza and colds; and for some time previous similar complaints had been prevalent throughout the West Indies.

The PRESIDENT said there was present that distinguished geographer of the seas, Captain Maury, who had recently arrived from America, and who was perhaps better acquainted than any other individual with the currents and tides of the Atlantic. Any observations he might offer upon the subject would be extremely gratifying to the Society.

CAPTAIN MAURY said he had scarcely come prepared to say anything at the Meeting, because, as they might well imagine, his mind for the last year or two had been occupied with subjects entirely different from ocean currents. In fact, much to his regret, he had now very little to do with the sea. Mr. Mann, in his interesting and philosophical paper, set out with a remark that is perfectly correct, and which every physical geographer who has attempted the study of the ocean has no doubt felt to be painfully true,—that these currents were most capricious things: they not only sometimes cease to run, but they occasionally turn and run backwards. The Gulf-stream is one of the most marked and interesting phenomena of the sea. When he was at Bermuda, on his way to England from South Carolina, he had the pleasure of meeting there the officers of some of Her Majesty's ships who had been cruising on the North American station for several years. One of them told him, as corroborative of what Mr. Mann had said, that he had found the Gulf-stream, on his passage from Halifax to Bermuda, actually running to the southward and westward. It struck him as being very singular. The temperature of the water was all right, but his reckoning was all wrong. So, when he went back he thought he would try it again, taking care to verify his instruments. Singularly enough, he found the Gulf-stream not running in its usual course, but running backwards. That the Gulf-stream is this capricious thing of creation needed no other evidence than the singularly mild winter we are now enjoying in Great Britain. In studying ocean-currents we have to look at what they do in the long run, because there are many exceptional cases. The case of the Guiana stream, mentioned by Mr. Mann, is almost as peculiar a phenomenon as that of the Gulf-stream running backwards. The current is well known among all Brazilian navigators; and consequently, when they wish to sail from Para, at the mouth of the Amazon, to Rio de Janeiro, they make a stretch to the northward and westward until they get up to 25° or 30° N., and in longitude 60° ; then getting into the trade-wind they go south again. Thus they dodge those very currents to which Mr. Mann had drawn our attention. Since he had been in England he had received one of the most valuable contributions to our knowledge of the currents of the Equatorial Atlantic that he had ever seen. It was the result of a great deal of patient observation and research by Mr. Capella, the head of the Meteorological Observatory at Lisbon. That gentleman has constructed a wind-chart of the Equatorial Atlantic between the coast of Africa and the coast of America; he has discussed hundreds of observations, and he has established a well-marked current just on the north of the equator setting to the east, and another equally well-marked current just to the south of the equator setting to the west. At the same time he discussed the force of the wind; and he has found, just a little south of the Cape de Verd Islands, taking the form of an ellipse, a region in which the north-east trade-wind blows with the greatest force; and so in like manner he finds between St. Helena and Cape St. Roque a region where, as Jansen had shown, the south-east trade-winds blow with the greatest force. Now, if we have so many exceptions with the winds which have so much to do with currents, we may well expect to find occasional exceptions in the currents themselves.

The PRESIDENT, in presenting the last letter he had received from Dr. Livingstone, took a brief review of his operations on the Shiré river, and said that, pending the delay of carrying his vessel to that river from the Zambesi, he had gone northwards along the coast of Africa to the mouth of the river Rovuma. As that river lies to the north of all territories to which the Portuguese lay claim, Dr. Livingstone was anxious to ascertain how far commercial enterprise could be established between its mouth and the countries watered by the Shiré. He then read the following letter:—

“ River Rovuma, Oct. 10, 1862.

“ MY DEAR SIR RODERICK,—We have just returned from a month's boat exploration of the Rovuma River. We turned at long. $38^{\circ} 3' E.$ and lat. $11^{\circ} 13' S.$; so, assuming the longitude of the anchorage to be $40^{\circ} 30' E.$, and lat. $10^{\circ} 28' S.$, we went about 114 miles, as the crow flies, from the coast. Adding our longitude and latitude together, we went 156 miles up the river. It was unusually and excessively low, and entailed frequent dragging of the boats at the crossings. When the water split up into three channels the work was grievous; but having chosen the dry season, when we cannot do much in the Zambesi, we put ‘a stout heart to a stey brae,’ never stopped except on Sundays, and after 15 days up and 10 down find ourselves rather tired and brown.

“ The bed of the river is about three-quarters of a mile wide. It is flanked by a well-wooded table-land, which looks like ranges of hills, 500 feet high. Sometimes the spurs of the high land come close to the water, but generally there is a mile of level alluvial soil between them and the bank. So few people appeared at first, it looked like a ‘land to let;’ but, having walked up to the edge of the plateau, considerable cultivation was met with, though to make a garden a great mass of brushwood must be cleared away. The women and children fled; but calling to a man not to be afraid, he asked if I had any objection to ‘liquor with him,’ and brought a cup of native beer. There are many new trees on the slopes, plenty of ebony in some places, and thickets of brushwood. The whole scenery had a light gray appearance, dotted over with masses of green trees, which precede the others in putting on new foliage, for this may be called our winter. Other trees showed their young leaves brownish red, but soon all will be gloriously green. Further up we came to numerous villages, perched on sandbanks in the river. They had villages on shore, too, and plenty of grain stowed away in the woods. They did not fear for their victuals, but were afraid of being stolen themselves. We passed through them all right, civilly declining an invitation to land at a village where two human heads had been cut off. A lot of these river-pilots then followed us till there was only a narrow passage under a high bank, and there let drive their arrows at us. We stopped and expostulated with them for a long time; then got them to one of the boats, and explained to them how easily we could drive them off with our rifles and revolvers, but we wished to be friends, and gave about 30 yards of calico in presents, in proof of friendship. All this time we were within 40 yards of a lot of them, armed with muskets and bows, on the high bank. On parting, as we thought, on friendly terms, and moving on, we received a volley of musket-balls and arrows, four bullet-holes being made in my sail; but finding that we, instead of running away, returned the fire, they took to their heels, and left the conviction that these are the Border ruffians who at various points present obstacles to African exploration—men-stealers, in fact, who care no more for human life than that respectable party in London who stuffed the ‘Pioneer's’ life-buoys with old straw instead of cork. It was sore against the grain to pay away that calico; it was submitting to be robbed for the sake of peace. It cannot be called ‘black mail,’ for that implies the rendering of important services by Arabs; nor is it ‘custom dues.’ It is robbery perpetrated by any one who has a traveller or trader in his power, and, when tamely submitted to, increases in amount till wood, water, grass, and every conceivable subject of offence is made occasion for a fine. On our return we passed quietly through them all, and probably the next English boat will be respected. Beyond these Makonde all were friendly and civil, laying down their arms before they came near us. Much trade is carried on by means of canoes, and we had the company of seven of these small craft for three days. They bring rice and grain down to purchase salt. When about 60 miles up, the table-land mentioned above retires, and we have an immense plain, with detached granite rocks and hills dotted over. Some rocks then appear in the

river, and at last, at our turning point, the bed is all rocky masses, four or five feet high, with the water rushing through by numerous channels. The canoes go through with ease, and we might have taken the boats up also, but we were told that further up the channels were much narrower, and there was a high degree of probability that we should get them smashed in coming down.

"We were on part of the slave-route from the Lake Nyassa to Quilwa (Kilwa), about 30 miles below the station of Ndonge, where that route crosses Rovuma, and a little further from the confluence of the Liende, which, arising from the hills on the east of the Lake Nyassa, flows into Rovuma. It is said to be very large, with reeds and aquatic plants growing in it, but at this time only ankle-deep. It contains no rocks till near its sources on the mountains, and between it and the lake the distance is reported to require between two and three days. At the cataracts where we turned there is no rock on the shore, as on the Zambesi, at Kebrabasa, and Murchison's Cataracts. The land is perfectly smooth, and, as far as we could see, the country presented the same flat appearance, with only a few detached hills. The tsetse is met with all along the Rovuma, and the people have no cattle in consequence. They produce large quantities of oil-yielding seeds, as the sesame, or gerzelin, and have hives placed on the trees every few miles. We never saw ebony of equal size to what we met on this river; and as to its navigability, as the mark at which water stands for many months is three feet above what it is now, and it is now said to be a cubit lower than usual, I have no doubt that a vessel drawing when loaded about 18 inches would run with ease during many months of the year. Should English trade be established on the Lake Nyassa, Englishmen will make this their outlet rather than pay dues to the Portuguese.

"We return to put our ship on Nyassa, by the Shiré, because there we have the friendship of all the people, except that of the slave-hunters. Formerly, we found the Shiré people far more hostile than are the Makonde of Rovuma, but now they have confidence in us, and we in them. To leave them now would be to open the country for the slave-hunters to pursue their calling therein, and we should be obliged to go through the whole process of gaining a people's confidence again.

"It may seem to some persons weak to feel a chord vibrating to the dust of her who rests on the banks of the Zambesi, and thinking that the path thereby is consecrated by her remains. We go back to Johanna and Zambesi in a few days. Kind regards to Lady M., and believe me ever affectionately yours,

"DAVID LIVINGSTONE."

The second Paper read was—

2. *Survey of the Physical Condition of the Atlantic Sea-bed, with special regard to the Establishment of Telegraphic Communication between Europe and America.* By G. C. WALLICH, Esq., M.D.

IN support of the view that the amount and kind of information heretofore possessed by us regarding the bed of the Atlantic, are altogether inadequate to meet the requirements of Oceanic Telegraphy, Dr. Wallich called attention to the fact that, up to the present period, only one reliable line of soundings has been taken to the southward of N. lat. 55°; and in this line only 41 soundings